

## UEE201 ELECTRICAL MACHINES

L	T	P	Cr
3	1	2	4.5

**Course Objective:** To introduce the fundamentals of transformer, dc machines and ac machines.

**Energy Conversion Principle:** Magnetic field, Field energy, Mechanical forces and torques in singly-excited and doubly-excited systems, Electric field.

**Rotating Machines:** Concepts of reluctance and electromagnetic torques, Concept of transformer and speed e.m.f's. and torque in round-rotor machines.

**Transformers:** Theory and operation, Phasor diagram, Equivalent circuit, Open circuit and short circuit tests, Regulation, Performance estimation, Auto-transformers, Parallel operation, Three phase transformer connections, Instrument transformers: Current Transformer (CT) and potential transformer (PT); Pulse transformers.

**DC Machines:** Methods of excitation, Magnetization and operating characteristics of generators, Starters, Speed-torque characteristics of DC motors. Speed control, Losses and efficiency. PM motors.

**Induction Machine:** Induction motor principle and applications as stepper and brushless motors, Induction motor equivalent circuit, Torque-slip characteristics, Methods of starting, Speed control of 3-phase induction motor.

**Polyphase Synchronous Machines:** MMF and EMF phasor, Concept of synchronous reactance, Regulation by EMF and MMF methods, Synchronous motor starting and V-curves.

**Induction Machines:** No load and Blocked rotor tests, Starters. Synchronous Machines: Regulation calculation by EMF method.

### Laboratory Work:

DC machines: Constructional features, Characteristics of generators and motors, Speed control, Efficiency. Transformers: Open and short circuit tests, Parallel operation, Harmonics in no-load current.

### Course Learning Outcome (CLO):

After the completion of the course the students will be able to:

1. Test the transformer and calculate its efficiency and performance in distribution system.
2. Scrutinize three-phase transformer connections and use special purpose transformer for measurement and protection.
3. Select appropriate DC motor for specific purpose and can compute their steady performance.
4. Thoughtfully select the speed control and starting method of DC motor.
5. Test the induction motor and compute its parameters.
6. Test the synchronous motor to compute voltage regulation.

### Text Books:

1. Bimbhra, P.S., *Electrical Machinery*, Khanna Publishers (2008).
2. Mukherjee, P.K. and Chakravorty, S., *Electrical Machines*, Dhanpat Rai and Co. (P) Ltd. (2004).

3. *Nagrath, I.J and Kothari, D.P., Electric Machines, Tata McGraw Hill (2004).*

**Reference Books:**

1. *Bimbhra, P.S., Generalized Theory of Electrical Machines, Khanna Publishers (2007).*
2. *Toro, Vincert, Electromechanical Devices for Energy Conversion, Prentice Hall of India (2004).*
3. *Fitzgerald, A.E., Kingsley, C. Jr, and Umans, Stephen, Electric Machinery, McGraw Hill (2002).*

**Evaluation Scheme:**

<b>Sr.No</b>	<b>Evaluation Elements</b>	<b>Weightage (%)</b>
1	MST	25
2	EST	35
3	Sessionals (May include Assignments/Projects/Tutorials/Quizes/Lab Evaluations)	40